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THE FITCHBURG PLAN OF INDUSTRIAL EDUCATION

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Can the public schools of our country be so vitalized in purpose and methods that their graduates may be of immediate service to business men and to manufacturers, instead of necessitating two or three years more of special training in order properly to perform their duties? This is the question that is today agitating the educational and industrial world and causing the directors of educational effort to examine their curriculum and methods with unusual care and discrimination. The tremendous growth of our industrial plants and products, and the consequent competition of rival manufacturers are calling for a greater number of better-trained workers than the market can supply.

In the past, if a young man desired to learn a trade (which was considered to be a most laudable ambition) he started at the very bottom of the ladder. He swept out the office, ran errands, and did a thousand and one things which seemingly had little to do with learning the trade he intended to follow. Then he was promoted into the shop and was initiated into the mysteries of shop freemasonry to which every journeyman looks back with pleasant recollections, though at the time his companions saw the joke more readily than he. Gradually the disagreeable tasks gave way to the operating of the various machines, and, after four or five years of practice, the apprentice emerged a full-fledged journeyman, and according as he had "applied himself diligently to learning the secrets of the trade," as required in his apprenticeship papers, he became more or less proficient as a mechanic.

It was customary for the son of a mechanic to follow his father's occupation, and consequently the trades had a good supply of help. But, as inventions increased the complexity of machinery and the mechanic saw the necessity of education, more of our boys went to school and in many cases, it is regrettable to say, also got the idea that the trades were less desirable as a means of earning a livelihood. To be dressed up and shine in society seems to be the aim of many of our boys under the present educational system.

With the improvement in machinery came the automatic operation of them, and the increase of jigs and special fixtures made it possible to use a lower grade of workman for their operation. Thus the lack of apprentices did not seriously hamper the shop production.

Then another factor, the automobile, came upon the scene. The manufacture of these took thousands of skilled workers without turning out any appreciable number of mechanics to compensate for the increased demand, and the problem of securing this help has become a serious matter for the whole country.

The public-school system as operated in the past has had as its goal the fitting of pupils for the colleges. Those who must by choice or necessity go to work at a trade had to take the same course of study as the boy who expected to become a lawyer or professional man.

Our manual-training schools tried in a measure to meet this objection, giving a certain amount of hand training, but as many wished to go to higher institutions the fitting of students for those institutions still constituted their main purpose. Then as a further step the trade school was inaugurated.

In this case the boys are given three or four years' instruction in certain trades such as foundry-work, carpentry, pattern-making, etc., under the supervision of men some of whom are practical journeymen. There is perhaps one journeyman for twenty or thirty boys, giving a cut-and-dried course. The work when completed is more often than not broken up and thrown away and the boys feel that it's only a piece of play-work anyhow. The pupil performs the various operations in a perfunctory manner and if, after spending five or six times as much labor on the work as is necessary, the work is spoiled he is told to make another piece and so on until he gets it right. This method lacks the commercial aspect, the idea of work on something that is to be used for a purpose, and the feeling that it must be made right the first time.

In April, 1908, there was presented to the metal manufacturers at a meeting in New York City a plan which overcomes all of these objections. It is the plan of Professor Herman Schneider, dean of the University of Cincinnati. In connection with the engineering department of the university there has been inaugurated a system of co-operation between the shops of the city and the university, whereby the shop takes charge of the practical training of the students and the university teaches the theory. By this method the university is relieved of the necessity of equipping its laboratories with expensive machinery which in the course of ten or fifteen years may become obsolete, and the students are getting a practical training such as no school can possibly furnish. They are working in actual commercially operated plants, the hum of industry is on every hand, and push and go are necessary in order to hold one's place in the shop organization.

Mr. Daniel Simonds, President of the Simonds Manufacturing Co., and several other Fitchburg manufacturers were present at this meeting and the simplicity and practicability of the plan appealed to them immediately. Here was a method that could be adapted to high-school boys who wished to learn a trade and continue their education at the same time. A plan was drawn up by the manufacturers for a combination shop and school course and presented to the school authorities, offering the use of their shops for the practical instruction of apprentices if the school would provide the necessary collateral instruction. This the school agreed to do and the following manufacturers entered into the plan: The Simonds Manufacturing Co., manufacturers of saws and knives; the Fitchburg Steam Engine Co., manufacturers of steam engines; the Bath Grinder Co., manufacturers of grinding machinery; the Blake Steam Pump and Condenser Co., manufacturers of pumping machinery; the Cowdrey Machine Co., manufacturers of special and wood-working machinery; the Putnam Machine Co., manufacturers of lathes, planers, railroad tools, and general machinery, and the Fitchburg Machine Co., manufacturers of the "Lo-Swing" lathe.

The course outlined is of four years' duration, the same as the regular high-school course. The first year is spent wholly in school and the next three alternate weekly between shop and school. The manufacturers take the boys in pairs so that by alternating they have one of the pair always at work, and, likewise the school is provided with one of the pair. Each Saturday morning the boy who has been at school that week goes to the shop in order to get hold of the job his mate is working on and be ready to take it up Monday morning when the shop boy goes into school for a week. Shop work consists of instruction in the operation of lathes, planers, drilling machines, bench and floor work, and such other machine work as the ability of the apprentice may allow. Boys receive pay for the weeks they are at work at these rates: For the first year, 10 cents an hour; the second year, 11 cents an hour; and the third year, 12½ cents an hour, making $5.50 a week or $165 for the first year; $6.05 a week, or $181.50 for the second year; and $6.78 a week, or $206.25 for the third year. This is a total of $552.75 for the three years. These rates are higher than the former apprentices have been receiving, the manufacturers having of their own accord raised the wages.

Here then is a strong inducement for the boy to continue in school: he can earn some money; in fact he gets more than he could get by going out and taking the ordinary jobs in stores or offices. Again, many parents cannot afford to keep their children in school under the usual conditions. This furnishes them an opportunity for contributing to their support and a chance to continue their education. During the past year one of our co-operative students was the only support of a family for several months. When there is a vacation week in school, work is provided in the shops so that the boy doesn't have to loaf around the streets with his hands in his pockets looking for mischief. These periods add to the amount of money I have just indicated as his yearly wage.

Every candidate is given a trial period of two months beginning immediately at the close of school in June, and if he likes the work and shows aptitude for the trade he takes the course, otherwise he drops out and, if he chooses, takes up some other course in the high school. Thus we give the boy an opportunity to find himself, something that has hitherto been lacking in our schools.

The question might be raised as to the physical strain of working a week in the shop with regular shop hours, for these boys have no special privileges in the shops, they are subject to all of the shop rules the same as the regular workmen. Not a single complaint has been made by the boys that the work is too hard, they come to school bright and active and the fact that they have the strength and ambition to enter the various track events discounts any fear in that direction.

What we believe to be a strong feature of this course is the agreement entered into by the boy and his employer. It is proverbial that the modern boy is a very unstable article; he tries this and that and is very loath to settle on one thing. Now after he has had a trial period of two months and is satisfied that he wants to learn a trade, his parents agree that he shall stick to it for three years, and the manufacturer on his part agrees to teach him the various branches of the trade designated in this agreement. It is a business contract and means something. I found, in a trip through the West the past summer, that only those places which had this written agreement between the apprentice and the employer had any success with their apprenticeship system.

What should be taught in such a course as this? Since the school term is only twenty weeks a year it is evident that only such subjects as are of practical value to the student in the pursuit of his livelihood, looking of course to advancement in that pursuit should be included. In fact that was the point insisted upon by the manufacturers, that this course be such as would make better mechanics, capable of advancing to the highest possibilities in the trade.

The work in *English*, given throughout the four years, includes forms of business papers, shop terms, and spelling.

The course in *current events and industrial history* includes a study of the daily happenings in the industrial world, the history of the iron industry, the factory system, labor problems, and new inventions, and the reading of mechanical journals.

The *mathematics* begins with simple propositions in mensuration, fractions, the metric system and circular measure. General shop mathematics deals with problems on cutting speeds and feeds, belting, gearing, strength of materials, and general cost figuring. Algebra is taken up to give facility in handling the formulae common in the trade journals and handbooks, and leads up to simple geometric and trigonometric formulae. The practice rather than the theory of mathematical science is sought.

In what we term *mechanism,* we treat of the construction and uses of the various machine tools that every shop contains. The names and uses of every part are learned in the school as well as in the shop. The reason for certain shapes of the various parts, kinds of material used in their construction, shapes and kinds of tools used and their cutting action are clearly pointed out in the analysis of the shop work.

In *physics* the study of working examples is emphasized rather than the theories of abstruse phenomena.

In *chemistry* we emphasize tests that can be ordinarily applied to fractured metals and the tempering processes.

Commercial geography comprehends the study of the source of supply of the various industries, preparation and methods of transportation, cost of materials, railway systems, waterways, etc.

First aid to the injured.—There is no place where accidents are more liable to happen than in the shop and some knowledge of how to care for them is a valuable asset to the workman. The textbook of the National First Aid Association is used for this study.

Drawing is the sign language of the mechanic. Almost invariably in explaining an object or piece of work he takes his pencil and makes or attempts to make a drawing to make his remarks more vivid. Hence we devote a large share of our drawing period to freehand work. We begin with simple objects and then take up machine parts. Thus the boy sees the object and at the same time becomes familiar with the proportions and shapes of ordinary machine parts. Later he draws them mechanically with instruments to scale.

Civics and American history are included for obvious reasons.

The course in *business methods* comprises the study of the organization of shop systems, including the receiving of materials, laying out of work, tagging, and inspecting.

The workman will see the dependence of one department on the other, the necessity for the co-operation of all to insure good results. He will appreciate the cost of doing business, and he will see that it is not all profit, that it costs something to erect and equip a manufacturing plant, conduct an office, and maintain a corps of salesmen and advertising agents. In short it will give him some idea of the great responsibilities of the employer. It will help solve the labor-and-capital problem.

The method pursued to put the scheme into operation was this: On August 1, 1908, I began interviewing applicants and their parents. Previously the high school and public had been informed that the course would start up that fall. Boys who wished to follow the trades were selected in preference to others and eighteen were chosen to start the course. By daily visits to the shops during this period the arrangements were made for starting work and by the opening of school in September these boys were all at work. On the seventh of the month the boys were paired off and half of them remained at work while the rest came to school. Some boys dropped out and others came into the course, so that our first-year course, which started with the second or half-school-and-shop year has twenty-two pupils in it.

This year a first-year or all-school class has been started in addition to the second- and third-year classes, giving us a total of sixty boys.

By weekly visits to the shops and inquiries of the boys in their school week I keep in close touch with their work. Should a boy feel that he is not getting just what he should he is not at all slow in making the fact known. Then by taking the matter up with the proprietors and foremen we soon find out whether or not a change should be made. There has been just one objection: the boys are so ambitious that they want to tackle jobs that they are not qualified by experience to handle. This is a laudable ambition and we try to show them the steps necessary to make them capable for that work.

Every opportunity for questions regarding shop work is encouraged in the school and these questions are of a most intelligent nature. Many problems are ironed out that the shop has not the time to consider and the interchange of methods used in the different shops broadens and helps all the boys.

The question has been asked, "What about the boy who wants to go to a technical school?" While this course was intended for those who wanted to become mechanics upon the completion of the course, they have, nevertheless, an excellent foundation for a technical-school candidate. By putting in another year at the high school in the study of a foreign language and a few other college-required subjects he is not only well prepared but exceptionally so. He knows what he is going for and can pass off his shop work and a great deal of drawing. Instead of losing he is a gainer. Several of our boys are looking forward to this plan.